

## Claims

1. An antenna, comprising:

a ground pattern; and

5 a planar element that is fed and has a cut-out portion formed from an edge portion farthest from a feed position to the ground pattern side, and

wherein said ground pattern and said planar element are juxtaposed with each other.

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2. The antenna as set forth in claim 1, characterized in that said planar element is disposed so that an edge portion other than said cut-out portion provided for said planar element is opposite to said ground pattern.

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3. The antenna as set forth in claim 1, characterized in that said ground pattern is formed without surrounding the entire edge portion of said planar element so that an opening with respect to at least a part of an edge portion of said planar element, which includes said cut-out portion, is provided.

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4. The antenna as set forth in claim 1, characterized in that said cut-out portion has a rectangular shape.

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5. The antenna as set forth in claim 1, characterized in that said cut-out portion is formed symmetrically with respect to a line passing through said feed position.

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6. The antenna as set forth in claim 1, characterized in that said planar element has such a shape that a bottom side thereof is opposite to said ground pattern, lateral sides thereof is provided vertically

or substantially vertically to said bottom side, and said cut-out portion is provided in a top side thereof.

7. The antenna as set forth in claim 6, characterized in that both  
5 corners of said bottom side are splayed.

8. The antenna as set forth in claim 1, characterized in that at least one of said planar element and said ground pattern has a portion that causes to continuously vary a distance there between.  
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9. The antenna as set forth in claim 1, characterized in that at least a part of an edge portion of said planar element, which is opposite to said ground pattern, is curved.

15 10. The antenna as set forth in claim 1, characterized in that said planar element is integrally formed in or on a dielectric substrate.

11. An antenna dielectric substrate, comprising:

20 a layer formed of a dielectric material; and  
a layer containing a conductive planar element in which a cut-out portion formed from an edge portion nearest to a first side surface of said antenna dielectric substrate toward a second side surface opposite to said first side surface.

25 12. The antenna dielectric substrate as set forth in claim 11, characterized in that said cut-out portion has a rectangular shape.

13. The antenna dielectric substrate as set froth in claim 12, characterized in that said cut-out portion is formed symmetrically  
30 with respect to a line passing through a feed position of said planar element.

14. The antenna dielectric substrate as set forth in claim 12,  
characterized in that said planar element has such a shape that a side  
thereof nearest to said second side surface is a bottom side, lateral  
5 sides thereof are provided vertically or substantially vertically to  
said bottom side, and said cut-out portion is provided in a top side  
nearest to said first side surface.

15. The antenna dielectric substrate as set forth in claim 14,  
10 characterized in that both corners of said bottom side are splayed.

16. The antenna dielectric substrate as set forth in claim 12,  
characterized in that an edge portion of said planar element, which  
is nearest to said second side surface, has a portion that continuously  
15 varies a distance with said second side surface.

17. The antenna dielectric substrate as set forth in claim 12,  
characterized in that said planar element has a connection portion  
with an electrode provided at least on said second side surface.

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18. An antenna, comprising:

a planar element that is fed; and

a ground pattern juxtaposed with said planar element, and

wherein said ground pattern is trimmed to have a continuous

25 varying portion causing to continuously vary a distance between said  
planar element and said ground pattern.

19. An antenna, comprising:

a planar element that is fed at a feed position;

30 a ground pattern that is juxtaposed with said planar element  
and in which a tapered shape is formed with respect to said feed position

of said planar element.

20. The antenna as set forth in claim 19, characterized in that said tapered shape is composed of any one of an edge portion composed of  
5 segments, an edge portion composed of curved lines being convex upwardly, and an edge portion composed of curved lines being convex downwardly.

21. The antenna as set forth in claim 19, characterized in that said  
10 tapered shape is symmetric with respect to a straight line passing through said feed position of said planar element.

22. The antenna as set forth in claim 19, characterized in that a  
15 concavity to accommodate a portion for feeding to said feed position of said planar element is formed at a tip of said tapered shape.

23. The antenna as set forth in claim 19, characterized in that said  
20 planar element is formed in or on a dielectric substrate, said ground pattern is formed in or on a resin board, and said dielectric substrate is mounted on said resin board.

24. The antenna as set forth in claim 23, characterized in that said  
25 planar element has a shape in which a bottom side thereof is opposite to said ground pattern, lateral sides thereof are provided vertically or substantially vertically to said bottom side, and a cut-out portion is provided in a top side thereof.

25. The antenna as set forth in claim 23, characterized in that said  
30 dielectric substrate on which said planar element is formed is mounted at an upper end of said resin board, and said ground pattern is formed to have a region extending toward at least either of a right side and

a left side of said dielectric substrate.

26. The antenna as set forth in claim 23, characterized in that said dielectric substrate on which said planar element is formed is mounted  
5 at least either of a right upper end and a left upper end of said resin board, and said ground pattern is formed to have a region extending toward an opposite side to a side at which said dielectric substrate is mounted.

10 27. An antenna, comprising:

a dielectric substrate on which a planar element is formed; and  
a board on which said dielectric substrate is mounted, and in  
or on which a ground pattern is formed to be juxtaposed with said dielectric substrate, and

15 characterized in that said ground pattern has a tapered shape with respect to a feed position of said planar element, and said planar element has a cut-out portion formed from an edge portion farthest from said feed position toward the juxtaposed ground pattern side.

20 28. The antenna as set forth in claim 27, characterized in that two said dielectric substrates are respectively disposed on a right upper end of said board and on a left upper end of said board, and are disposed a quarter wavelength apart from each other, and said ground pattern has a region to separate one said dielectric substrate from another  
25 said dielectric substrate.

29. A wireless communication card, comprising:

a dielectric substrate on which a planar element is formed;  
a board on which said dielectric substrate is mounted, and in  
30 or on which a ground pattern juxtaposed with said dielectric substrate is formed, and

characterized in that said ground pattern has a tapered shape with respect to a feed position of said planar element and said planar element has a cut-out portion formed from an edge portion farthest from said feed position toward the juxtaposed ground pattern side.

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30. An antenna, comprising:

a ground pattern; and

a planar element that is fed and whose edge portion opposite to said ground pattern has a continuous varying portion making a distance with said ground pattern vary and being composed of at least  
10 either one of a curved line and line segments which are connected while their inclinations are changed stepwise, and

characterized in that said ground pattern is juxtaposed with said planar element, without surrounding the entire edge portion of  
15 said planar element.

31. The antenna as set forth in claim 30, characterized in that said distance from said continuous varying portion to said ground pattern is gradually increased as being farther away from said feed position  
20 of said planar element.

32. The antenna as set forth in claim 30, characterized in that at least a part of said continuous varying portion is composed of an arc.

25 33. The antenna as set forth in claim 30, characterized in that at least a part of an edge portion other than said continuous varying portion of said planar element is formed so as to be opposite to the ground pattern side.

30 34. The antenna as set forth in claim 30, characterized in that said ground pattern is formed to have an opening with respect to at least

a part of an edge portion other than said continuous varying portion of said planar element.

35. The antenna as set forth in claim 30, characterized in that said  
5 planar element has a cut-out portion formed from an edge portion farthest from said feed position of said planar element toward the ground pattern side.

36. The antenna as set forth in claim 35, characterized in that at  
10 least a part of an edge portion of said planar element, which includes said cut-out portion, is formed at a position being not opposite to said ground pattern.

37. The antenna as set forth in claim 30, characterized in that said  
15 ground pattern is formed to have a tapered shape with respect to a feed position of said planar element.

38. The antenna as set forth in claim 30, characterized in that said  
20 planar element is symmetric with respect to a straight line passing through a feed point of said planar element.

39. The antenna as set forth in claim 30, characterized in that a  
distance between said planar element and said ground pattern is  
symmetric with respect to a straight line passing through a feed  
25 position of said planar element.

40. The antenna as set forth in claim 30, characterized in that said  
planar element is formed on or in a resin substrate, and said distance  
from said continuous varying portion to said ground pattern is  
30 increased to become saturated as being farther away from said feed position of said planar element.

41. An antenna, comprising:

a ground pattern; and

a planar element that is fed and whose edge portion opposite  
5 to said ground pattern has a continuous varying portion making a  
distance with said ground pattern vary and being composed of at least  
either one of a curved line and line segments which are connected while  
their inclinations are changed stepwise, and

characterized in that said ground pattern is disposed without  
10 surrounding the entire edge portion of said planar element, and said  
planar element and said ground pattern are disposed without complete  
overlap with each other, and both planes thereof are parallel or  
substantially parallel to each other.

15 42. An antenna, comprising:

a ground pattern; and

a planar element that is fed and whose edge portion opposite  
to said ground pattern has a continuous varying portion at which a  
distance with said ground pattern is gradually increased from a feed  
20 position, and

characterized in that said ground pattern is juxtaposed with  
said planar element without surrounding the entire edge portion of  
said planar element.

25 43. An antenna, comprising:

a planar element that is fed at a feed position; and

a ground pattern that is juxtaposed with said planar element,  
and

characterized in that as being farther away from a straight line  
30 passing through said feed position, a distance between said planar  
element and said ground pattern is gradually increased to become



saturated.

44. The antenna as set forth in claim 43, characterized in that a side  
edge portion of said planar element is constituted by either one of  
5 a curved line and line segments, which are connected while their  
inclinations are changed stepwise, and said planar element is formed  
on or inside a dielectric substrate.

45. The antenna as set forth in claim 44, characterized in that said  
10 dielectric substrate further comprises a resonant element connected  
to an end point of said planar element on said straight line passing  
through said feed position of said planar element.

46. The antenna as set forth in claim 45, characterized in that said  
15 resonant element is symmetrical with respect to said straight line  
passing through said feed position of said planar element.

47. The antenna as set forth in claim 45, wherein said resonant element  
is asymmetrical with respect to said straight line passing through  
20 said feed position of said planar element.

48. The antenna as set forth in any one of claims 45 to 47, characterized  
in that said planar element and said resonant element are formed in  
a same layer of said dielectric substrate.

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49. The antenna as set forth in any one of claims 45 to 47, characterized  
in that said planar element and at least a part of said resonant element  
are formed in different layers.

30 50. The antenna as set forth in any one of claims 45 to 49, characterized  
in that when said planar element and said resonant element are

projected on a virtual plane parallel to layers in which the respective elements are formed, said resonant element is disposed without overlapping with a predetermined region defined beside said planar element projected on said virtual plane.

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51. The antenna as set forth in any one of claims 45 to 49, characterized in that when said planar element and said resonant element are projected on a virtual plane parallel to layers in which the respective elements are formed, said resonant element is disposed without overlapping with at least a region at a planar element side with respect to a half line, which is parallel to said straight line passing through said feed position of the projected planar element and extends in a feed position direction from a start point that is an end point of said side edge portion of the projected planar element and is a point remoter from said feed position.

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52. A dielectric substrate for an antenna, comprising:

a dielectric layer; and

a layer including a conductive planar element having a side edge portion constituted by either one of a curved line and line segments, which are connected while their inclinations are changed stepwise, and

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characterized in that a distance between a side surface closest to a feed position of said planar element among side surfaces of said dielectric substrate and said side edge portion is gradually increased to become saturated as being farther away from a straight line passing through said feed position.

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53. The dielectric substrate as set forth in claim 52, characterized in that said dielectric substrate further comprises a resonant element connected to an end point of said planar element on said straight line

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passing through said feed position of said planar element.

54. The dielectric substrate as set forth in claim 53, characterized in that said resonant element is symmetrical with respect to said  
5 straight line passing through said feed position of said planar element.

55. The dielectric substrate as set forth in claim 53, characterized in that said resonant element is asymmetrical with respect to said  
10 straight line passing through said feed position of said planar element.

56. The dielectric substrate as set forth in any one of claims 53 to 55, characterized in that said planar element and said resonant element  
15 are formed in a same layer of said dielectric substrate.

57. The dielectric substrate as set forth in any one of claims 53 to 55, characterized in that said planar element and at least a part of said resonant element are formed in different layers of said dielectric  
20 substrate.

58. The dielectric substrate as set forth in any one of claims 53 to 57, wherein when said planar element and said resonant element are projected on a virtual plane parallel to layers in which the respective  
25 elements are formed, said resonant element is disposed without overlapping with a predetermined region defined beside said planar element projected on said virtual plane.

59. The dielectric substrate as set forth in any one of claims 53 to 57, wherein when said planar element and said resonant element are projected on a virtual plane parallel to layers in which the respective  
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elements are formed, said resonant element is disposed without overlapping with at least a region at a planar element side with respect to a half line, which is parallel to said straight line passing through said feed position of the projected planar element and extends in a feed position direction from a start point that is an end point of said side edge portion of the projected planar element and is a point remoter from said feed position.

60. An antenna, comprising:

10       a dielectric substrate in or on which a planar element that is fed at a feed position is integrally formed; and

      a ground pattern that is juxtaposed with said dielectric substrate and is formed to have a tapered shape with respect to said feed position, and

15       characterized in that said planar element has a cut-out portion formed from an edge portion farthest from said feed position toward the ground pattern side.

61. A wireless communication card, comprising:

20       a dielectric substrate in or on which a planar element that is fed at a feed position is integrally formed; and

      a board on which said dielectric substrate is mounted, and in or on which a ground pattern that is juxtaposed with said dielectric substrate is formed, and

25       characterized in that said dielectric substrate is mounted at an end portion of said board, and

      said ground pattern is formed to have a tapered shape with respect to said feed position, and a region extending toward at least either of a right side and a left side of said dielectric substrate,

30       and

      said planar element has a cut-out portion formed from an edge

portion farthest from said feed position toward the juxtaposed ground pattern side.